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The Effects of Imagery, Cognitive Modification, and  
Cognitive Style, in Dealing with Pain

by



Irwin Allan Raphael

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE  
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THE UNIVERSITY OF ALBERTA  
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled The Effects of Imagery, Cognitive Modification, and Cognitive Style, in Dealing with Pain submitted by Irwin Allan Raphael in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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## Abstract

The central focus of this research involved the comparison among three techniques: a self-instructional, an imagery, and a placebo control technique, on enhancing tolerance to pain.

A review of the Cognitive Behavior Therapy literature revealed that (a) Stress Inoculation (SI) used both self-instructional and imagery techniques, and that there was little research comparing these two approaches; (b) there was some research to suggest that individuals might respond differentially to either a verbal (self-instructional) or visual (imagery) treatment approach depending on their cognitive style, that is, whether they were "visualizers" or "verbalizers"; (c) there was a lack of consensus among researchers concerning the relationship between personality traits and pain tolerance.

An initial study showed that both self-instructional and imagery techniques were more effective than a control treatment in enhancing tolerance to the cold pressor task. In a second study, sixty subjects were randomly assigned to either a self-instructional or imagery treatment to test for cognitive style and mode of treatment interactions, as well as personality traits and pain tolerance relationships.

Subjects were pre-tested on the cold pressor task and then received either self-instructional or imagery training. The subjects were then post-tested on the cold-pressor task





to assess pain tolerance. All subjects were administered the Visualizer Verbalizer Test (VVQ, Richardson, 1977), and the Kujt Form Function Test (KFFT) to assess cognitive style, and the Jackson Personality Inventory (JPI, Jackson, 1976) to assess personality. All subjects also completed a seven point self-report questionnaire to assess how much discomfort they experienced during the cold pressor tests.

Results indicated that the self-instructional and imagery techniques were equally as effective in enhancing tolerance to pain, as measured by the cold pressor test. There was a significant treatment-cognitive style interaction only when the KFFT was used to assess cognitive style, and only for female verbalizers who did significantly better in the self-instructional group than in the imagery group.

There were positive correlations between age and pre-test and post-test scores, as well as anxiety and pretest scores. There were negative correlations between the cognitive style of "visualizer" and the personality traits of cognitive complexity and social participation. There were positive correlations between the cognitive style of "visualizer" and the personality traits of anxiety and conformity.



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## I. INTRODUCTION

There has been a phenomenal rise in the use of cognitive therapy as a therapeutic modality during the past decade. One need only to peruse the latest professional journals, or note the founding of the new publication *Cognitive Therapy and Research* in 1977 to substantiate this claim. Bergin and Garfield, in their handbook of psychotherapy (1978) devoted a major chapter to this area (see chapter by Mahoney and Arnkoff on Cognitive and Self Control Therapies).

Cognitive therapy is a generic term that refers to a variety of therapeutic approaches, whose major mode of action is modifying the faulty assumptions, patterns, and attitudes underlying a patient's cognitions (Meichenbaum, 1974). The cognitive therapist attempts to make clients aware of their negative self-statements and images, and replace them with more positive self-verbalizations.

Many of the principles espoused by the cognitive approach have been used by the ancient Greek and Roman philosophers (Meichenbaum, 1977). It was not until recently, however, that the efficacy of the treatment was systematically explored in the laboratory. Evidence for the therapeutic effectiveness of cognitive therapy has been offered by many different investigators, including Ellis and Harper (1976), and Meichenbaum (1974; 1977). These different cognitive approaches have a common premise that by making clients aware of their thinking style, and conveying to them



that this can be changed into a set of self-statements that are incompatible with the previous negative statements, a more adaptive style of thinking will occur.

A cognitive approach that stresses the modification of the client's internal dialogue (self-talk) is that developed by Meichenbaum (1974;1977) and is usually referred to as Cognitive Behavior Modification(CBM). CBM has been used with both adults and children for a wide variety of problems. In his recent newsletter, which is a summary of the current research in the field, Meichenbaum (1979) cites dozens of studies in which CBM was utilized successfully.

CBM is not, however, a unitary treatment, but is instead comprised of many different strategies. One approach within the CBM framework is called Stress Inoculation Training(SI), and as the name indicates it is concerned primarily with helping people cope with stress related events. Recently, SI has become the treatment of choice in the area of psychological pain control (Meichenbaum and Turk, 1976).

The professional literature relating to the treatment of pain suggests that pain should be considered as an individual's subjective experience, which is determined by physiological as well as psychological factors (Freese, 1974). The fact that the experience of pain has a large psychological component has led a number of researchers to investigate the best way to manipulate psychological mediators to augment existing medical treatments. As stated,





SI appears to be an effective psychological treatment in enhancing tolerance to pain.

SI training as originally conceived by Meichenbaum (1977) consisted of three phases: (1) Education; (2) Rehearsal or Skills Training; and (3) Application. While research has shown that all three phases are important, it has been suggested that it is the rehearsal, or skills training phase that is responsible for most of the behavior change occurring (Hussian & Lawrence, 1978).

The rehearsal phase of SI is however itself multifaceted, and relies on such diverse techniques as self-instructional training and imagery manipulations. As Tucker, Shearer, and Murray (1977) have pointed out, SI actually has two components--the verbal, logical self-instructional aspect, and the non-verbal, global, imagery component. In the actual implementation of SI by Meichenbaum (1977) and Meichenbaum and Turk (1976), both the verbal and imagery approaches were used with the same client.

With the verbal component, emphasis was placed on teaching clients to monitor and change what they were telling themselves about the stressful event (self-talk). The imagery approach focuses on having clients change or transform the experience of pain or stress by means of fantasy, or by having individuals visualize themselves coping with the difficult situation. Turk (1978) cites three types of imagery manipulations:



1. Imaginative inattention in which the person ignores the stress or pain by engaging in goal directed fantasy, which if real, would be incompatible with the experience of pain (for example, lying on a beach on a pleasant day).
2. Imaginative transformation of context, in which the person includes the stress or pain in the fantasy, but now transforms these sensations as something other than pain, or minimizes the sensations as trivial or unreal.
3. Imaginative transformation of context, in which the person includes the stressful event in the fantasy, but now transforms the context or setting in which the event occurs (for example, imaging that one is a spy who has been shot in the arm and is being chased by enemy agents).

Recently, there has been an emphasis on dismantling the component parts of SI in order to establish which are the effective factors contributing to behavior change (Jaremko, 1979). There seems to be a consensus among researchers (Glowgower, Fremow and McCroskey, 1978; Horan, Hackett, Buchanan, Stone and Demchik-Stone, 1977) that while SI is effective, it is a lengthy treatment, and that perhaps not all of its component parts are necessary for behavior change to occur. Previous dismantling studies by Jaremko (1979), Glowgower et al. (1978), and Horan et al. (1977) have examined the various stages of SI, that is the education phase, the skills training phase, and the





application phase. There have not however, been many well controlled studies of the skills training phase, which is composed of both imagery and self-instructional (verbal) components.

The study of tolerance to pain is a logical choice with which to examine the effective components of the skills training phase, as SI was devised to deal primarily with stress and pain related disorders (Meichenbaum, 1977).

The comparison of the imagery and self-instructional techniques takes on added importance in view of the recent research (Tucker, Shearer, and Murray, 1977) that suggests that individuals respond differently to verbal or visual input. That is, some individuals prefer imagery treatments, while others seem to do better with a verbal, logical approach.

### **Nature of the Problem**

While acknowledging that SI is effective, it appears that more research is required in dismantling its component parts, specifically the imagery versus the self-instructional techniques in the skills training phase. While both imagery training and modifying self-verbalizations have been shown to be effective in the control of pain when used together as a treatment package, there has been a paucity of well controlled studies directly comparing these two approaches. The fact that individuals might do better with one type of treatment depending on



their "cognitive style", that is whether they are "visualizers" or "verbalizers" (Richardson, 1977) suggests that this comparison has practical as well as theoretical implications.

### Purpose of the Study

Given the current popularity of stress inoculation in the treatment of pain, a study was formulated to examine the two components of the skill training phase of SI (imagery and verbal). More specifically, two major objectives of the study can be outlined: (a) To compare the effectiveness of the self-instructional and the imagery techniques to one another, and to a control treatment; (b) To examine whether there is a treatment-cognitive style interaction, that is whether visualizers do better with one type of treatment, and verbalizers with another.





## Definition of Terms

In the previous section outlining the purpose of the study, several terms were mentioned whose definition should facilitate understanding of the nature of the study. These definitions follow:

*Stress Inoculation (SI)* SI is one of the treatments in the cognitive behavior therapy school. It involves modifying both the client's images and self-verbalizations, and is generally used to reduce anxiety, stress, or pain.

*Self-Instructions* Self-instructions, or self-talk, are the statements that individuals tell themselves about events, or how they are going to cope with the event.

*Imagery Techniques* Imagery, as used in this study refers to pictorial thinking, or images as distractors, as in the behavior therapy techniques of desensitization or emotive imagery.

*Verbalizer* This is a cognitive style (Richardson, 1977) that refers to a style of learning and information processing that is primarily logical and linear.

*Visualizer* This is a cognitive style (Richardson, 1977) that refers to a style of learning and information processing that is primarily spatial and global.



## Limitations of the Study

The study was an analogue treatment and therefore generalization from the discomfort induced by the cold-pressor task to real clinical pain was limited.

While the Visualizer-Verbalizer Quotient Test (VVQ) is acknowledged to be one of the better instruments in discriminating the cognitive style of "visualizer" and "verbalizer" the use of a paper and pencil test to assess this trait is of questionable validity. Although the VVQ did yield extreme scores, one wonders whether these scores were in fact representative of the dimensions. The Kuijt Form-Function Test (KFFT), the other instrument used to assess cognitive style, has yet to be validated and more research on establishing norms is required.

The imagery and self-instructional treatments were brief, consistent with other analogue studies, and one wonders whether a more lengthy treatment would have resulted in a more realistic approximation of a treatment session.

Finally, since the post-test occurred only minutes after the treatment, there was no way to assess whether the treatments were retained by the subjects after any interval of time.



## Implications of the Study

Stress Inoculation is still a relatively new treatment in the area of pain control, and more research is required to show that it is more effective than a control treatment. A review of the psychological approaches to pain control by Liebeskind and Paul (1977) in "The Annual Review of Psychology" did not mention SI. If therefore the self-instructional and imagery components are shown to be more effective than a control treatment, then this will be a validation of a promising technique.

A main emphasis for psychological interventions, according to Bergin and Garfield (1978) is the question of what treatments work with what type of individuals. By examining the issue of cognitive style and differential response to treatment, this question will be addressed, and any findings will therefore have important clinical implications.

The idea that certain personality types tolerate pain better than others has received equivocal support in the literature. This study will hopefully resolve some of these ambiguities by administering the Jackson Personality Inventory (JPI) to all subjects to investigate the relationship between pain tolerance and personality traits.





## Overview of the Study

The description of the study just outlined progresses as follows. Chapter 11 contains a review of the literature related to cognitive therapy, imagery therapy, and cognitive style. This is followed by a discussion of the methodology employed in the study, including the results of a preliminary research project conducted prior to the central experiment. The thesis concludes with a presentation of the results of the study, along with a discussion of the implications, and suggestions for further research.



## II. Review of Related Literature

### Cognitive Behavior Modification

CBM has been used with both adults and children with a variety of difficulties. With children, one aspect of CBM, self-instructional training, has recently become an important treatment for hyperactivity and distractability. Self-instructional training involves teaching children to monitor their overt motor behavior by "talking to themselves" or changing their internal dialogue.

Recent studies that have used self-instructional training to help children labelled hyperactive include those by Bugenthal, Collins, Collins and Chaney (1978), and Neilans and Israel (1979) cited in Meichenbaum (1979). The general research strategies employed in these studies was a comparison of three groups: one receiving self-instructional training; one receiving the same practice as the self-instructional group, but no self-instructions; and a control group. These studies are merely representative of the many that have shown self-instructional training to be effective with children.

CBM has been used to help adults overcome a diverse range of problems. Recent research has focused on phobias, social anxiety, test anxiety, depression, and stress and pain tolerance. As with the use of CBM and children, the literature with adults is voluminous and a representative





survey of ongoing research will be presented.

*Phobias* A major thrust of the CBM modality with regard to phobias, has been to assess the role that cognitions play in engendering phobic reactions (Meichenbaum, 1979). Some recent work in the field includes research by May (1977) who showed that self-regulated thoughts such as phobic ideation had an effect on a person's physiological functioning. Denney, Sullivan and Thury (1977) in an analogue study compared self-verbalization training, modelling, and behavioral rehearsal in reducing fear of spiders. The self-verbalization of counter-phobic coping statements, while practicing counter phobic behaviors enhanced treatment efficacy.

McClellan and Cappe (cited in Meichenbaum, 1979) have also found that a CBM approach was successful in helping individuals overcome their fear of flying.

*Social Anxiety* The CBM approach to social anxiety has also focused on the role of cognitions in contributing to maladaptive behavior. Cacioppo, Glass and Merluzzi (cited in Meichenbaum, 1979) examined the role of self-statements in contributing to social anxiety. They identified high and low socially anxious males, and then prepared subjects for an encounter with a female. Each subject's self-statements during a waiting period were assessed by means of a thought listing procedure. It was found that high anxiety subjects spontaneously generated more negative self-statements than did low socially anxious males.



Halford(cited in Meichenbaum,1979) took Cacioppo et al's findings into account and conducted three studies on the nature of social anxiety. He found that a social skills group, plus cognitive restructuring, was more effective in fostering assertiveness than either treatment package alone. The study provided further evidence that focusing on cognitive factors can enhance treatment efficacy.

*Test Anxiety* The important role of cognitions in contributing to and maintaining test anxiety has also been noted by a number of researchers. Meichenbaum (1979) cites a dozen studies that have recently investigated this area. Hussian and Lawrence (1978),for example, provided evidence for the efficacy of CBM in the treatment of test anxiety at both a three week and nine month follow-up. They also found that test specific coping statements were more effective than generalized self-statements. Examples of the former included "one step at a time", "I can handle the situation", while an example of the latter is "I know I am well prepared for this test, so just relax".

The studies cited in the areas of phobias, social anxiety, and test anxiety, are merely representative of the voluminous research currently being undertaken. In addition, CBM is being used with the aged, individuals with sexual dysfunctions, and depressives, to list but a few areas.



## Psychological Approaches to Pain Control

As mentioned in the introduction, Stress-Inoculation has recently become a viable treatment in the area of pain tolerance. Prior however to examining the current research, an analysis of previous psychological interventions for pain tolerance will be presented.

Individuals have used cognitive strategies to help them deal with pain for hundreds of years (Turk, 1978). The stoic philosophers believed that man could get the better of pain through the forces of reason, or "The rational repudiation of pain". Both Descartes and Spinoza recommended that pain should be overcome through the "permeation of reason" (Meichenbaum and Turk, 1976). In the Koran, the prophet instructs the faithful of Islam "When anyone suffers from a toothache, let him lay a finger upon the sore spot and recite the sixth sura". It was not, however, until recently that cognitive techniques were systematically explored in an experimental manner.

Barber and Hahn (1962) found that a group of subjects given "waking imagined analgesia" were able to tolerate the cold-pressor test for as long as a group of subjects given hypnotically suggested analgesia. It should be noted that waking analgesia is similar to what is now being called "in vivo emotive imagery" (Horan, 1974; 1977). Emotive imagery will be discussed in greater detail in the section on imagery approaches to therapy.





Gelfand (1964) examined the effects of permissive and non-permissive instructions on pain threshold (reporting when pain is first noticed) and pain tolerance (ability to withstand pain for as long as possible). Permissive instructions are similar to placebo instructions as the subjects were given no special instructions on how to cope, while subjects in the nonpermissive group were told to try and tolerate the pain for as long as possible. Gelfand found that non-permissive instructions enhanced pain tolerance, but not pain threshold, thus supporting the view that pain tolerance has a large psychological component, while pain threshold is basically physiologically determined.

Wolff, Krasnegor and Farr (1965) also examined the effects of permissive versus non-permissive instructions on pain tolerance and pain threshold. Gelfand's results were substantiated, as non-permissive instructions resulted in significant increases for pain tolerance, but not threshold. Wolff concluded that the hypothesis that pain tolerance and pain threshold have different loadings of physiological and psychological components was valid. He also found that the non-dominant hand was more sensitive to pain.

Blitz and Dinnerstein (1968) found however that the pain threshold could be increased by specific instructions. The issue of whether one should examine pain tolerance or threshold has obvious implications for outcome measures and it appears that the field is divided as to which should be used.



Some of the confusing and contradictory findings reported in the literature can be attributed to researchers using different outcome measures. It should also be noted that in these early experiments using "permissive" and "non-permissive" instructions, treatment(if it could be called that) was extremely brief and consisted of the experimenter simply stating "I'd like you to try and tolerate the pain a bit longer". These non-permissive instructions are similar to what is now referred to in the literature as attention control groups.

In the past decade, researchers became more sophisticated in their designs and treatments. Neufeld (1970) examined the effects of three forms of cognitive appraisal on the tolerance of radiant heat. These forms were:

1. thinking of pain as being pleasurable(denial),
2. thinking of pain as being a protective reaction of sensory nerves, and
3. thinking of a blank wall.

Again, the resemblance of the denial treatment to what has been called emotive imagery should be noted.

Bobey and Davidson (1970) found that relaxation and cognitive rehearsal were more effective than a control treatment in enhancing tolerance to radiant heat. Unlike previous research which had found cognitive rehearsal superior to relaxation, Bobey and Davidson found that relaxation was better than cognitive rehearsal. Both were



however superior to a control treatment.

Spanos, Horton and Chaves (1975) tested the effectiveness of two cognitive strategies on pain threshold. They found that subjects could keep their hands in ice cold water longer if they thought about something completely unrelated to cold water (irrelevant strategy) or if they thought about something incompatible with being cold (relevant strategy). An example of the relevant strategy was imagining being in a desert, while the irrelevant strategy consisted of imaging a professor giving a lecture in the room next door. Both strategies were effective for subjects with low pain thresholds, while only the relevant strategy was effective for subjects with high pain thresholds. It should be noted that the treatments in this study were again very brief and utilized imagery.

Horan (1973;1974;1976;1980) was however one of the first researchers to explicitly call his treatment an imagery treatment, and to systematically use fantasy and imagery in the control of pain. His technique, called "In Vivo Emotive Imagery" has been shown to be effective in reducing childbirth anxiety and discomfort, dental discomfort, and in enhancing tolerance to the cold-pressor task. Emotive imagery will be discussed in the section on imagery approaches to therapy.

Jaremko (1978) tested the following strategies in the control of pain; reversal of affect, rationalization, irrelevant thinking, and no strategy. The reversal of affect





is similar to what Barber and Hahn called waking analgesia, and what Spanos, Horton and Chaves had termed "relevant strategy". The rationalization strategy involved having the subjects tell themselves that the reason they were involved in the experiment was for school grades. Both these approaches proved to be more effective than the irrelevant or no strategy groups. It should be emphasized that the rationalization strategy, which involved some "self-talk" bears hardly any resemblance to the notion of self-talk as described by Meichenbaum in his stress-inoculation paradigm.

Finally, Beers and Karoly (1979) found that both imaginal and rational thinking strategies were superior to control treatments in enhancing pain tolerance as measured by the cold-pressor task. While their study was one of the first to directly compare imagery and verbal strategies, their "rational thinking" condition merely consisted of having subjects make brief positive self statements about the task, and is again is only vaguely similar to the self-instructional procedure devised by Meichenbaum.

### **Stress Inoculation and Pain**

The research on psychological approaches to pain control have tended to isolate a specific technique and compare it to a control or irrelevant treatment. Meichenbaum (1977), Meichenbaum and Turk (1976) and Turk (1978) developed a comprehensive approach to pain control which they called Stress Inoculation(SI).



As mentioned in the introduction to the study, SI is a multifaceted approach that does not emphasize one treatment strategy. Meichenbaum and Turk based their treatment on Melzack's (1977) theory of pain. Melzack had argued that pain perception is a complex phenomenon resulting from the interaction of sensory discriminative, motivational-affective and cognitive evaluative components. SI attempts to teach clients how to control their pain by showing them specific techniques that they can employ to deal with the various aspects of the pain experience. Subjects are told that they can control pain at the sensory level by physical and mental relaxation, at the motivational-affective level by imagery manipulation, and at the cognitive level by cognitive restructuring.

Turk (1978) states that the SI approach is more effective than merely having the subject engage in one strategy. In the SI paradigm, the client has the option of utilizing the relaxation component, imagery component, or cognitive component either singularly or in any combination.

The initial results of SI on the control of pain appear promising. Turk (1978) was able to enhance tolerance to ischemic pain using an SI treatment. Similar positive results have been reported by Rybstein-Blinchik and Gresiak (cited in Meichenbaum, 1979) with five chronic pain patients. Meichenbaum (1977;1979) cites numerous research studies (unpublished) that support the efficacy of SI on the control of pain.



As stated, SI utilizes a number of different techniques, and recently researchers have become interested in examining the different components of SI. As mentioned in the introduction to the study, the skills training phase of SI uses both self-instructional (verbal) and imagery approaches to induce behavior change.

Researchers have recently begun to investigate both the self-instructional and imagery components of SI. Hussian and Lawrence (1978) examined the self-instructional aspect and found that merely identifying negative self-statements was not enough, but that the negative statements had to be replaced with more positive coping statements. Worthington (1978) investigated the use of imagery in the skills training phase and found that the type of imagery used does not make a difference as both positive and neutral imagery were effective in enhancing tolerance to pain.

To date there has only been one study that has compared the self-instructional with the imagery technique in the control of pain (Hackett and Horan, 1980). Hackett and Horan reported that the self-instructional approach was not successful in increasing tolerance to pain, relative to an imagery or a control training group. This conclusion was reached, however, despite the fact that the self-instructional group appeared to make significant increases in the amount of time that they were able to tolerate the cold-pressor task. Hackett and Horan also reported that most subjects did not follow the





self-instructional technique as they found it boring and cumbersome. Their study appears to go against a growing body of literature that testifies to the efficacy of self-instructional training for a variety of problems. An analysis of their statistical procedures suggests however a number of computational errors making their results highly questionable.

It would seem that perhaps a step "backwards" or further dismantling studies on SI are required. This position has become more important in view of the recent rediscovery of the use of imagery in therapy, and recent research (Tucker, Shearer, and Murray, 1977) which suggests that certain individuals respond better to verbal techniques and others better to imagery techniques.

### Review of Imagery Approaches to Therapy

The fact that Stress-Inoculation has made extensive use of imagery is not surprising in view of the rediscovery of imagery approaches to therapy. As Sheikh (1977) has noted, the last decade has witnessed a marked resurgence of interest in images by psychologists of various persuasions.

Sheikh and Panagiotou (1975) in their review of the use of mental imagery in therapy, note that imagery has been used differently by therapists of divergent backgrounds. They have therefore devised a three-fold classification of the available approaches. These are:

1. The psychoanalytical and neoanalytical schools



observations regarding spontaneous images during therapy;

2. The depth psychologists use of images in therapy;
3. The use of imagery by the behaviorists and cognitive behaviorists, or imagery as an alternative explanation for the deconditioning effect.

It is the latter approach that has the most relevance for the use of imagery in the SI model.

Briefly examining the other approaches, one notes that the analytic schools believe that imagery is important in therapy because of its primordial function and is a direct voice to the unconscious. The level of consciousness at which the imagoic mode functions is believed to have special properties which allow a therapeutic effect to take place through the manipulation of symbols. This is believed to occur without any accompanying verbal insight. Even though the individual may not understand the pictorial language, he somehow integrates its message into his life (Shiekh and Panagiotou, 1975). Also within the analytic framework is the view that spontaneous imagery which occurs during therapy is a representation of a latent or unconscious verbal idea, and that this occurs in many individuals in times of verbal blockage (Sheikh & Panagiotou, 1975). Reher and Smeltzer (1968) regard visual imagery as the vehicle for the symbolic representation of unconscious conflicts.

The "depth" psychologists view images as replicas of reality, as well as symbols that represent collections of



interwoven associations loaded with emotional energy (Sheikh and Panagiotou, 1975). These symbols are viable at personal concrete levels, as well as at abstract or universal levels. Depth psychologists believe that in terms of the images a person experiences, they may begin with mundane individual forms and move along an axis of broadening significance until they experience mythological and religious meaning.

In the review of psychological approaches to pain control, it was noted that many of the cognitive strategies used some type of imagery manipulation, although they were often called different terms. As Sheikh has noted, numerous behaviorist procedures have used imagery in an attempt to demonstrate the power of images to act as potent stimuli.

Systematic desensitization was one of the first behavioral techniques to employ imagery. The procedure is well known and basically involves teaching the client to relax, and then imagine anxiety inducing scenes in a descending hierarchy. The images utilized are reality based and there is no element of symbolism, or distortion of the images, as prescribed by the therapist. Systematic desensitization has been shown to be effective in alleviating various problems, although there is still uncertainty as to how it works (Bergin and Garfield, 1978).

Imagery has also played a major role in the behavioral technique of flooding or implosive therapy. Here the client is instructed to image the anxiety arousing scene in hopes of extinguishing the maladaptive response. Again, the manner





in which the technique induces change is not known, but visual imagery does appear to play a role in the treatment.

In a variation of desensitization, Lazarus and Abramovitz (1962) and Lazarus (1977) have suggested that emotive imagery be used for deconditioning anxiety. In this approach, fantasy imagery is used to counteract the fearful or anxiety producing stimuli. For example, a child who was fearful of going to the doctor was instructed to imagine that Batman and Robin were accompanying him.

Horan (1973; 1974; 1976; 1980) found that emotive imagery was effective in enhancing tolerance to dental discomfort, childbirth anxiety, and tolerance to the cold-pressor task. Horan's work was alluded to in the section on psychological approaches to pain control. His technique of emotive imagery essentially consists of teaching clients to imagine reality based events that are personally pleasing to the individual. For example, lying on the beach in the Mediterranean, or lying relaxed on a comfortable deserted lakeside are scenes that many people find appealing. His approach is similar to Lazarus' but consists of reality based fantasies. Horan (1974) states:

"That in vivo emotive imagery the positive feelings engendered by the images block the anxiety arising from the uncomfortable situation, and the images themselves may serve to lessen 'real' pain."

It should be noted that the type of imagery employed by Turk and Meichenbaum in their SI treatment is similar to what



Horan has called emotive imagery, although fantasy imagery such as Lazarus used is also employed.

The behaviorists and cognitive behaviorists also believe that images provide the client with a clear cognitive understanding of their perceptual distortion, which even though conscious, may only vaguely be sensed (Sheikh & Panagiotou, 1975). They believe that the repetition of image fantasies is often accompanied by cognitive restructuring. That is, images, spontaneous or induced, may clarify for the individual his or her cognitive distortions and provide valuable information for the understanding of an inappropriate reaction.

Other variants in the behavioral and cognitive behavioral use of imagery, include the work of Cautela (1967) who made explicit use of covert imagery in his work. Cautela constructed specific scenes that portray a pattern of responses that formed an alternative to the behavior troubling the client. The client was then instructed to practice these images extensively during the day. This approach differs from that of Horan and Lazarus, as negative images are extensively used. For example, clients who wished to lose weight would be instructed to actively imagine themselves vomiting everytime they took a bite of food.



## Cognitive Style

The overview of some of the approaches that use imagery is by no means exhaustive but rather is meant to illustrate that the use of imagery techniques in therapy is now a respectable topic. The resurgence of interest in imagery based therapies has prompted researchers to investigate whether differences in visualizer-verbalizer cognitive style are related to therapeutic success. Sheikh and Panagiotou (1975) state that no systematic observations of individual differences and their relation to the successful use of images has been found. Researchers have generally failed to find any consistent relationship between the ability to image and success in therapies such as systematic desensitization or rational emotive imagery (Davis, 1976; Davis, McClenmore & London, 1969).

There is in fact reason to believe that subjects might actually do better in the mode of treatment that is different from their cognitive style (Tucker, Shearer & Murray, 1977) although more research is required to verify this claim.

Prior to examining whether there is a relationship between the cognitive style of visualizer-verbalizer and treatment preference, it is important to try and identify these "styles". Bandler and Grinder (1976; 1979) state that people have different representational systems (verbal or visual) and that if one listens carefully to how they communicate it is possible to discern their preferred mode





of operation. For example, an individual who is always saying "I see what you mean", or "that looks right to me" would probably be a visualizer. Bandler and Grinder maintain that these cognitive styles are fairly easy to detect if one is an astute observer.

Despite their view, a major stumbling block in trying to identify visualizers and verbalizers is the lack of reliable assessment devices. Traditionally, two approaches have been used to classify individuals' cognitive styles; (1) Imagery questionnaires, and (2) Lateral eye movements.

The use of imagery questionnaires has a long history beginning with Betts' Imagery Questionnaire, which was first developed in 1909 (Richardson, 1969). In a recent review of the literature on imagery tests, Hiscock (1978) found that most of them were lacking in validity or reliability. He did find, however, that Paivio's Imagery Test was both reliable and valid and stated:

No imagery questionnaire is likely to be the best choice for all applications. Paivio's IDQ promises to be a useful instrument for investigating habitual styles of information processing... consequently, it should be useful for studying the relationship of imagery to attitudes, career choices, and so on. The IDQ thus offers a means of validating the concept of visual imagery as a cognitive style.



Richardson (1977) selected 15 items from Paivio's IDQ and constructed a short self-report questionnaire for the measurement of individual differences on a "visualizer-verbalizer" dimension of cognitive style. Richardson incorporated the work on lateral eye movement in his test construction, as he chose criterion groups of extreme left and right movers to select 15 discriminating items from the IDQ.

Lateral eye movements (LEM) refer to the shifts in gaze to the left or to the right that occur when people engage in reflective thinking. During ongoing cognitive activity, shifts to the left are presumed to reflect right hemisphere dominance, and shifts to the right, left hemisphere dominance. Right hemispheric dominance is associated with "verbalizers", while left hemispheric dominance is associated with the cognitive style of "visualizer".

The issue of whether LEM's are in fact representative of different cognitive styles is a controversial one in the field. Although Richardson's short test was psychometrically satisfactory and predicted performance on other tasks related to left and right hemisphere functions, it failed to correlate with preferences for making left or right lateral eye movements in a later cross validation study.

Two major reviews of the literature (Richardson, 1978; Ehrlichman & Weinberger, 1978) suggest that the relationship between LEM and cognitive style is not as clearcut as was suggested by the early studies (Bakan, 1969; Weiten &



Etaugh, 1974). Both of the review articles mentioned numerous subject, task, and tester variables that have confounded past research. The consensus of opinion appears to be that more research is needed before one can state that LEM's are indicative of a person's cognitive style.

Ley (1979), after examining the review articles, concluded nevertheless that:

Mindful of Ehrlichman and Weinberger's caveats however, there still seems to be enough evidence for assuming the existence of a relationship between visual imagery and the right hemisphere, particularly if the purview is widened to include the wealth of studies demonstrating a strong, right hemisphere superiority for visual-spatial tasks.

As one can note, although the issue is far from being resolved, there is some support for using both paper and pencil tests and LEM's to assess cognitive style.

## Personality and Pain

Closely related to the area of cognitive style and pain tolerance, is the view that certain personality traits influence one's tolerance level.

There is no agreement in the literature regarding sex differences and pain tolerance. Whereas some researchers have found that women have a greater sensitivity to pain (Woodrow, Friedman, Sieglau, and Collen, 1975), others have found no significant difference between the sexes in pain





tolerance (Notermans and Tophoff, 1975; Freese, 1974).

There are few studies of racial and ethnic differences and pain tolerance, and the results of these are inconclusive. In a review of the literature on race differences and pain Woodrow et al. reached the following conclusions:

1. There is no experimental evidence to show that blacks have a lower pain tolerance than whites;
2. Orientals appear to have lower pain tolerance than black's or white's, but this was not well documented;
3. Jewish and other Mediterranean races had lower pain tolerance than other Caucasians or Northern Europeans. This conclusion was also based on one major study and has not been replicated.

Jacox and Stewart (1973) reviewed the literature on introversion-extroversion, anxiety, neuroticism, and pain tolerance and arrived at the following conclusions.

The generally accepted fact that extroverts tolerate pain better than introverts has not been proven conclusively, as there are studies (Davidson and McDougall, 1969) that found no correlation between these traits and pain tolerance on both the cold-pressor task and a radiant heat test. There is some empirical evidence for the proposition that increased anxiety is associated with increased pain. Negative correlations between anxiety level and pain threshold and pain tolerance have been found for both state and trait anxiety. Despite the relationship



between anxiety and pain tolerance, it was concluded that there is not a direct relationship between neuroticism and pain tolerance. Davidson and McDougall (1969) found nonsignificant correlations between neuroticism and pain tolerance. Petrie (cited in Jacox and Stewart) also found no relationship between neuroticism and pain tolerance. This was true whether the pain was clinical or experimentally induced.

There is also mixed evidence regarding the relationship between age and pain tolerance. Sherman and Robillard (cited in Stewart) and Hall and Stride (cited in Stewart) found older subjects had a higher tolerance for pain. Collins and Stone (1966) and Woodrow, Friedman, Siegelau and Morris (1975) however found that older subjects were less able to tolerate pain. One can note that the research on personality and pain tolerance is far from being resolved as a number of controversies still exist in the literature.

### Conclusions from the Literature

The literature cited suggests that while research in the areas of cognitive behavior therapy, imagery therapy, and cognitive style has proliferated, there has not been an attempt to integrate this research. It was also concluded that the current research on the cognitive style of visualizer-verbalizer could be the unifying factor in the self-instructional versus imagery component debate, as treatment mode could be related to cognitive style. It was



also concluded that more work is required in establishing the efficacy of both the self-instructional and imagery techniques relative to a control treatment. Finally, the research on personality traits and pain tolerance is extremely contradictory, and any new findings would help to clarify and possibly resolve some of the issues.

### Formulation of the Study

On the basis of the literature review, a study was conducted that attempted to synthesize the current research findings in Stress Inoculation, imagery therapy, cognitive style and pain tolerance. Specifically, the study was interested in comparing self-instructional and imagery treatments to one another and to a control treatment. The study also wished to examine whether there was a relationship between mode of treatment (visual or verbal) and cognitive style (visualizer or verbalizer). Finally the study was also interested in examining whether there were any differences in personality traits, as measured by the Jackson Personality Inventory(JPI) between those subjects who could tolerate pain and those who could not.





## Hypotheses

Six major directional hypotheses resulted from the review of the literature.

*Hypothesis 1* There will be a significant treatment effect for both the self-instructional and imagery groups.

*Hypothesis 11* There will not be a significant difference between the self-instructional group and the imagery group.

*Hypothesis 111* There will be a relationship between subjects' self-report of pain and their gain scores (difference between pre and post-test tolerance scores), as well as a relationship between self-report and treatment.

*Hypothesis 1V* There will be a relationship between subjects' cognitive style and mode of treatment. Given however the paucity of research in this area, it is difficult to make a directional hypothesis. That is, it is difficult to state whether visualizers will do better in the imagery or self-instructional groups, and whether verbalizers will do better in the imagery or self-instructional groups.

*Hypothesis V* Subjects in the self-instructional group will use the strategy that is taught. In spite of Hackett and Horan's (1980) findings that subjects did not utilize the self-instructional paradigm, it is felt that given the effectiveness of self-instructional training in other problem areas, it is a viable modality and if presented "in a proper manner" it will be used.

*Hypothesis VI* There will be a relationship between certain personality traits and pain tolerance, treatment preference,



and cognitive style. Given the contradictory research on the relationship among age, sex differences, and neuroticism with pain tolerance it is difficult to predict any direction between these variables and tolerance level. It was predicted however that subjects who scored high on cognitive complexity as measured by the JPI (Jackson, 1976) would prefer the more complex self-instructional approach. Subjects who scored high on risk taking, as defined by the Jackson Personality Inventory would be expected to have a higher pain tolerance.

In addition to these six major hypotheses, one exploratory hypothesis, regarding a new assessment device was made. The Kuijt Form-Function Test (KFFT) is a new test that is supposedly measuring similar factors that the Visualizer-Verbalizer Quotient (VVQ) is assessing. It was therefore hypothesized that there would be a positive correlation between the KFFT and the VVQ (Richardson, 1977).



### III. Methodology-Overview

The major purpose of the study was to compare the self-instructional treatment with the imagery treatment, and to examine if there were treatment and cognitive style interactions, as well as personality and pain tolerance interactions.

#### *Preliminary Research Project*

The first step towards conducting the study was the development of an initial research project. The chief aim of this study was to establish whether the self-instructional and imagery components of SI were more effective than a control treatment.

#### **Subjects**

Subjects for the study were 27 University of Alberta volunteers ranging in age from 19 to 40 years. At the time of their recruitment all subjects were taking at least one course in the Department of Educational Psychology. Subjects were randomly assigned to either a self-instructional treatment, an imagery treatment, or a control treatment.





## Apparatus

To test for tolerance to pain, the standard cold-pressor task was used (Worthington, 1978). A plastic bucket was filled with ice water and was maintained at approximately 0 degrees C by frequent additions of ice. No subject was allowed to keep his hand immersed in the water for longer than five minutes in order to minimize any danger.

## Procedure

Subjects were told that the rationale for the experiment was to investigate different techniques of coping with stress and pain.

*Pre-test* All subjects participated in a pre-test of tolerance to ice water by immersing their hands in the water for as long as possible. Based on previous research (Worthington, 1978), subjects who were able to tolerate the ice water for longer than four minutes were dropped from the study. As a result, three subjects were dropped from the experiment. The experimenter recorded the length of time that each subject was able to keep his hand immersed. Each subject was seen on an individual basis and, after the pre-test, was randomly assigned to one of the three treatments.

*Post-test* After the treatment, a post-test, a second cold-pressor test, was administered and subjects were instructed to employ the techniques that they were taught.



After the post-test, each subject stated what strategy he or she actually employed to help cope with the pain.

## Treatments

*Self-Instructional* Subjects in this group were given a verbal treatment based on the approach by Meichenbaum (1977)(APPENDIX 1). They were told that many people cannot tolerate discomfort as they unconsciously indoctrinate themselves with negative self-statements about the situation. They were told that any painful or stressful situation can be broken down into a series of phases, with the subject making the appropriate self-statements throughout each phase. Each subject then listened to an audio tape (approximately 10 minutes) that explained the phases and gave examples of appropriate coping statements. Subjects were allowed to generate their own coping statements when undergoing the post-test, and they were given a chance to covertly rehearse their strategy.

*Imagery Group* In the imagery treatment (APPENDIX 11), subjects were instructed in the use of imagery to enhance tolerance to pain. The approach used was a variation of that devised by Turk (1978). Three types of imagery were discussed: imaginative inattention, imaginative transformation of pain, and imaginative transformation of context. Subjects were told that they could choose any one of the above approaches when undergoing the post-test. As in the self-instructional group, subjects listened to a 10



minute tape that gave examples of these imagery techniques.

*Control Group* In the control group, subjects were told that knowledge about the psychology and physiology of pain increased tolerance. Subjects listened to a brief tape, approximately 10 minutes in length (APPENDIX 111), that discussed the psychology and physiology of pain but did not give any specific coping strategies.

## Results

A one-way analysis of variance was carried out on the gain scores as is suggested by Huck and Mclean (1975), followed by a Scheffe test (Ferguson, 1976) to test for significance between groups.

Results (Tables 1 and 2) show that both the imagery and self-instructional treatments were effective in increasing subjects' tolerance to pain, relative to a control treatment. There was no significant difference between the imagery and self-instructional groups (Table 3).

## Discussion

The results of the study appear to support the hypothesis that both the imagery and self-instructional treatments were superior to the control treatment. Contrary to the findings of Hackett and Horan (1980), there did not appear to be any significant difference between the imagery and self-instructional approaches. Following the treatment and post-test, subjects were interviewed and asked what





Table 1

Pre and Post-test Means and Standard  
Deviations of Treatment Groups  
on Cold Pressor Task

	Pre Mean	S.D.	Post Mean	S.D.
Imagery	51	53.48	168	90.38
Self-instruction	48	35.36	126	55.86
Control	68	35.23	84	40.34

Table 2

Summary of One-Way Analysis of Variance  
Comparing Treatments on Measure: Gain score

Source of Variation	SSQ	DF	MS	F
Between	46,581	2	23,290	12.3*
within	44,479	24	1,853	
Total	94,060	26		

\* $p < .001$

Table 3  
Scheffe Test

Groups	F
1, 11	3.16ns
1, 111	23.14**
11, 111	9.18*

\*\* $p < .001$

\* $p < .05$

group 1=imagery

group 2=self-instructional

group 3=control



procedures they used to help tolerate the cold-pressor task. While some subjects in the self-instructional group reported using imagery techniques, as was reported by Hackett and Horan, a similar crossover was also found in some subjects in the imagery treatment who used more self-instructional techniques.

Although there was insufficient data in this study to test out an interaction effect between certain client cognitive styles (visualizer versus verbalizer, Richardson, 1977) and the treatment used, some of the subjects' responses suggested that such an interaction might be occurring.

### Implications of the initial study

The results of the initial study influenced the nature of the thesis research in the following ways:

1. It was demonstrated that both the imagery and self-instructional groups were significantly better than the control treatment. As a result it was decided to omit the control group from the final study, and instead compare the imagery and self-instructional treatments on a variety of dimensions.
2. As a result of the initial study, the following procedural changes were made in the second study. Firstly, the imagery and self-instructional treatments were embellished in terms of length, but simplified in language. The second study would be run more like an



analogue therapy session, with the technical language kept to a minimum. Secondly, in order to standardize and facilitate recall of the actual strategy used, the post-test procedure would be videotaped, and the tape would be replayed to serve as a prompt, as subjects would see themselves undergoing the cold-pressor task. The subjects' answers would then be audiotaped and transcribed. In addition to establishing whether subjects used the technique taught, subjects would be asked what strategy (if any) they employed after the pre-test as Hackett and Horan had reported that many individuals spontaneously use imagery as a coping mechanism.

## Methodology of Thesis Research

### Research Design

A pre-test, post-test design, similar to the one used in the initial study, was utilized.

### Sample

Subjects for the study were 70 University of Alberta student volunteers between the ages of 19 and 50. Subjects were randomly assigned to either a self-instructional training group or to an imagery training group. Ten subjects





were not used in the study as they were able to tolerate the ice water during the pre-test for four minutes and did not therefore require any training in pain tolerance. Other researchers (Worthington, 1978) have found that if subjects can tolerate the cold-pressor for four minutes with no training then any treatment would be redundant.

All subjects were administered Richardson's Visualizer-Verbalizer Quotient Test (VVQ) (Appendix 1V), Kuijts Form-Function Test (Appendix V), The Jackson Personality Inventory, and a self-report questionnaire (Appendix V1) on the average amount of discomfort experienced while their hand was immersed in the water.

## Apparatus

The standard cold-pressor test used in the initial study was again administered.

## Procedure

Upon entering the laboratory, subjects were told that the rationale for the experiment was to study some of the effective techniques for controlling pain (Appendix V11).

*Pre-test* Each subject then participated in a pre-test of their tolerance to ice water (Appendix V111). Subjects who were able to tolerate the water for four minutes were not given any treatment but completed the other tests. During the pre-test the experimenter timed how long the subject kept his hand immersed in the cold water. The



experimenter could not be seen by the subject in order not to encourage any talking during the experiment.

After the pre-test, each subject was asked what he or she had done while his or her hand was immersed in the water, and the response was noted. Each subject then completed the self-report questionnaire, the VVQ, and the KFFT. Each subject was then assigned to either the imagery or self-instructional training group to be taught specific coping skills.

*Post-test* Following completion of the treatment, the post-test, a second cold-pressor test was administered. By this time approximately 50-60 minutes had elapsed since the pre-test, and the subject's hand had returned to normal feeling. During the post-test, subjects were videotaped in order to facilitate the post-experimental recall of the strategy actually used. After the post-test, subjects were again asked to complete the self-report questionnaire. In addition, a post-experimental interview was conducted to establish whether the subject employed the strategy that was taught. Subjects viewed the video of themselves undergoing the post-test and then spoke into a tape recorder and stated what they were doing to help cope with the discomfort.

Subjects were then debriefed as to the exact hypothesis of the study. All subjects were then given the JPI to complete during the following week. They were also told that if interested they could receive feedback on the tests.



## Treatments

*Self-instructional* The self-instructional technique used in this study (Appendix 1X) was similar to the one used in the initial study. A major difference, however, was that the language was simplified, and more concrete examples were given. Subjects were also encouraged to ask the experimenter for clarification of the various concepts if they were not clear. Subjects listened to the fifteen minute tape while reclining in a comfortable chair.

*Imagery* The imagery technique was also similar to that used in the initial study. As with the self-instructional group, the language was simplified and more concrete examples given (Appendix X). Two additional types of imagery were added, (a) neutral imagery, and (b) coping imagery, the latter being the imagery equivalent of the self-reinforcement stage of the self-instructional program.

As in the initial study, subjects in both groups were free to choose their own self-statements and images when undergoing the post-test.

In summary, all subjects were tested individually. Each subject was exposed to a pre-test (cold-pressor), completed three questionnaires (self-report, VVQ, KFFT), and stated what he or she did while his or her hand was in the water. They were then assigned to either a self-instructional or imagery training group and listened to a tape which discussed specific strategies for coping with pain.





After the treatment, each subject participated in a post-test, a second cold-pressor test, again completed the self-report questionnaire, and stated explicitly what he/she had done to cope with the second cold-pressor test. The subject was then debriefed and given the JPI to complete during the following week. The entire procedure took approximately one hour per subject.

### Dependent Variables

*Pain tolerance* It was decided to use pain tolerance (the amount of time subjects could withstand the cold) instead of pain threshold (the point at which subjects first begin to notice pain) as the dependent variable because tolerance has a larger psychological component (Gelfand, 1964). The cold-pressor test was used to assess pain since according to the literature (Brown, Fader and Barber, 1973; Clark and Hunt, 1971) it is the best laboratory analogy to pain.

*Self-report* The use of the post-hoc self report-questionnaire to assess discomfort has been well documented in the literature. Self-reports have been used by Spanos, Barber and Lang (1974), Stone, Demchik-Stone and Horan (1977, 1980), Jaremko (1978), and Worthington (1978). The use of self-report to assess discomfort as opposed to blood pressure is recommended by Hilgard (1969) who found blood pressure measures unreliable and stated that self-report measures were valid indices of subjective pain.



*Cognitive-Style Questionnaires* The VVQ and the KFFT were used to assess cognitive style. The top quartile scorers were designated as visualizers, the bottom fourth scorers as verbalizers, and the middle fifty percent as undifferentiated. This three group dichotomy was based on the observation that approximately twenty-five percent of the population will be extreme visualizers, and twenty-five percent extreme verbalizers (Richardson, 1977).

*Personality Questionnaire* The JPI (Jackson, 1976) was used to assess personality. The JPI yields sixteen personality scales. For each scale, scores were divided into the top quartile, bottom quartile, and middle fifty percent in order to be consistent with the scoring of the cognitive style tests.

*Use of Treatments* To assess whether subjects actually used the technique that was taught, the following procedure was employed.

Subjects watched a video of their post-test performance and were asked to describe (on an audio tape) what they were doing while their hand was in the ice water. The audio tape was then transcribed, and a random selection of thirty comments were given to two doctoral students in Educational Psychology. The students were asked to rate each subjects answer according to the following criteria:

1. Subject used treatment
2. Subject did not use strategy taught at all
3. Subject used strategy taught in combination with another



technique.

Each of the two graduate students were familiar with the criteria for choosing whether a given response was indicative of either the imagery or self instructional approach. There was a .90 inter-rater reliability between the students' ratings and those of the experimenter suggesting that it was fairly easy to discern whether subjects used the treatment. An example of one subject's post-experimental verbalization and the subsequent rating is found in Appendix X11.

## Analysis

Appropriate null hypotheses were developed to test the hypotheses derived from the literature review and will be presented along with the appropriate statistical procedures. Analysis of variance on the gain scores (Huck & Mclean, 1975) were carried out to test for significance. A significance level of  $P < .05$  was deemed necessary to reject the null hypothesis.





## IV. Results

The data collected during the experiment were analyzed statistically. Results of the analysis are described and discussed in this chapter according to the hypotheses previously set out.

Seventy subjects were originally selected to participate in the study. During the experiment, ten subjects were able to tolerate the pre-test for four minutes and thus were excluded from the following analysis, as recommended by Worthington (1978).

### Analysis of Data

The following are the null hypotheses. Where a direction was assumed, a one tailed test was used.

Hypothesis 1 stated that there would be no significant treatment effects for both the self-instructional and imagery treatments. The null hypothesis was rejected in both the initial study, and in the follow up study. In the initial study, a one-way analysis of variance was significant at the .05 level, and a Scheffe post hoc test showed that both the self-instructional and imagery treatments were superior to the control treatment (see Tables 1, 2, 3 initial study). In the thesis study, a T-test between the pre and post test scores for both the imagery and self-instructional groups was significant ( $P < .001$ ) (Table 4).



Hypothesis 11 had postulated that there would be a difference between the imagery and self instructional groups. A one-way analysis of variance indicated that there were no significant differences between the groups (Table 5) Table 6 presents the means and standard deviations of the gain scores of both treatment groups, and illustrates that there was not a significant difference between them.

Hypothesis 111 had stated that there would be no difference in a subject's self-report of pain and treatment taught, nor a relationship between self-report and gain score. The results of a three-way analysis of variance on self-report, sex, treatment, and cognitive style (Table 7) were not significant. The analysis suggests that self-report was not related to treatment, cognitive style or sex. There was however a significant positive correlation ( $r=.35$ ) between self-report and gain scores, suggesting that the longer subjects tolerated the cold-pressor task, the more discomfort they reported.

Hypothesis 1V had postulated that there would not be cognitive style-treatment interaction. The results of a three-way analysis of variance on gain scores, cognitive style, sex, and treatment were not significant when the VVQ was used to assess cognitive style (Table 8).

While there was no significant interaction when the VVQ was used to assess cognitive style, Table 9 shows that there was a significant 3-way interaction ( $P<.01$ ) between sex, cognitive style, and treatment when the KFFT was used to



Table 4

Pre and Post-Test Means and Standard  
Deviations of Treatment groups  
on Cold Pressor Task

	Pre		Post		t Value
	Mean	S.D.	Mean	S.D.	
imagery	64.41	58.26	149.75	118.63	4.74**
Self-In	43.22	34.48	165.61	112.67	6.66**

\*\*P<.001

Table 5

Summary of One-Way Analysis of Variance  
Comparing Treatments on  
Measure: Gain Score

	DF	SSq	MS	F
Between groups	1	17363.84	17363.84	1.69ns
Within	58	596100.50	10277	
Total	59	613464.31		





Table 6  
Summary of Means and Standard  
Deviations  
On Cold Pressor Test

Group	Mean	S.D.
Imagery	88.34	100.30
self-Ins	122.93	102.37
Total	105.93	101.96

Table 7  
Summary of Three-Way Analysis of Variance  
Comparing Sex, Treatment, and  
Cognitive Style(VVQ)on Measure: Self-Report

Source of Variation	SSq	DF	MS	F
Main effects	4.025	4	1.006	0.47ns
Sex	0.045	1	0.045	0.84ns
Treatment	0.531	1	0.531	0.49ns
Cognitive Style(VVQ)	3.301	2	1.651	0.24ns
2-Way Interactions	5.067	5	1.013	0.90ns
Sex X Treatment	0.242	1	0.242	0.21ns
Sex X VVQ	0.391	2	0.195	0.17ns
Treatment X VVQ	3.479	2	1.739	1.55ns
3-Way Interactions	3.222	2	1.611	1.44ns



Table 8

Summary of Three-Way Analysis of Variance  
Comparing Sex, Treatment and  
Cognitive Style(VVQ) on Measure: Gain Score

Source of Variation	SSq	DF	MS	F
Main effects	65167.43	4	16291.8	1.60ns
Sex	1891.50	1	1891.5	0.66ns
Treatment	11681.27	1	11681.3	0.29ns
Cognitive Style(VVQ)	47178.95	2	23589.5	0.10ns
2-Way interactions	43812.18	5	8762.4	0.51ns
Sex X Treatment	15748.69	1	15748.7	0.22ns
Sex X VVQ	10510.46	2	5255.2	0.60ns
Treatment X VVQ	10856.88	2	5428.4	0.54ns
3-Way interactions				
Sex X Treatment X VVQ	17471.75	2	8735.6	0.43ns

Table 9

Summary of Three-Way Analysis of Variance  
Comparing Sex, Treatment, and  
Cognitive Style(KFFT) on Measure: Gain Score

Source of Variation	SSq	DF	MS	F
Main effects	53129.54	4	13282.38	1.48ns
Sex	26.67	1	26.67	0.03ns
Treatment	10238.09	1	10238.09	1.14ns
Cognitive Style	35141.05	2	17570.52	1.96ns
2-Way Interactions	49414.58	5	9882.91	1.10ns
Sex X Treatment	19989.28	1	19989.28	2.23ns
Sex X Cognitive Style	19719.69	2	9859.84	1.12ns
Treat X Cognitive Style	284.50	2	142.25	0.016ns
3-Way Interactions				
Sex X Treatment X Cognitive Style	81392.75	2	40696.12	4.46*

\*P<.05



assess cognitive style.

A breakdown of the interaction indicates that male imagers did significantly worse in both treatments than either male verbalizers or undifferentiated individuals. Female verbalizers did significantly worse in the imagery treatment, and best in the self-instructional group. Female visualizers and female undifferentiated (adept at visual and verbal processing) did equally well in both treatments. These interactions are illustrated in Figures 1 and 2.

Hypothesis V had postulated that subjects in the self-instructional group would not use the treatment. A cross tabulation (Table 10) indicated that 77% of the subjects in the self-instructional group used the procedure exclusively, and another 13% used the procedure in combination with some other technique. Seventy-nine percent of the subjects in the imagery group used the technique they were taught exclusively, and another seven percent used the technique in combination with another approach.

Hypothesis VI had postulated that there would not be a relationship between certain personality traits and treatment preference and pain tolerance. The results of a Four-way analysis of variance on age, cognitive complexity, anxiety, and risk taking were not however significant (Table 11).

There were some significant correlations that proved to be interesting. There was a positive correlation between age and both pre and post-test scores ( $r = .45$  &  $.23$ ). There was





FIGURE 1  
Mean Gain Scores of Women  
on Cold Pressor Task

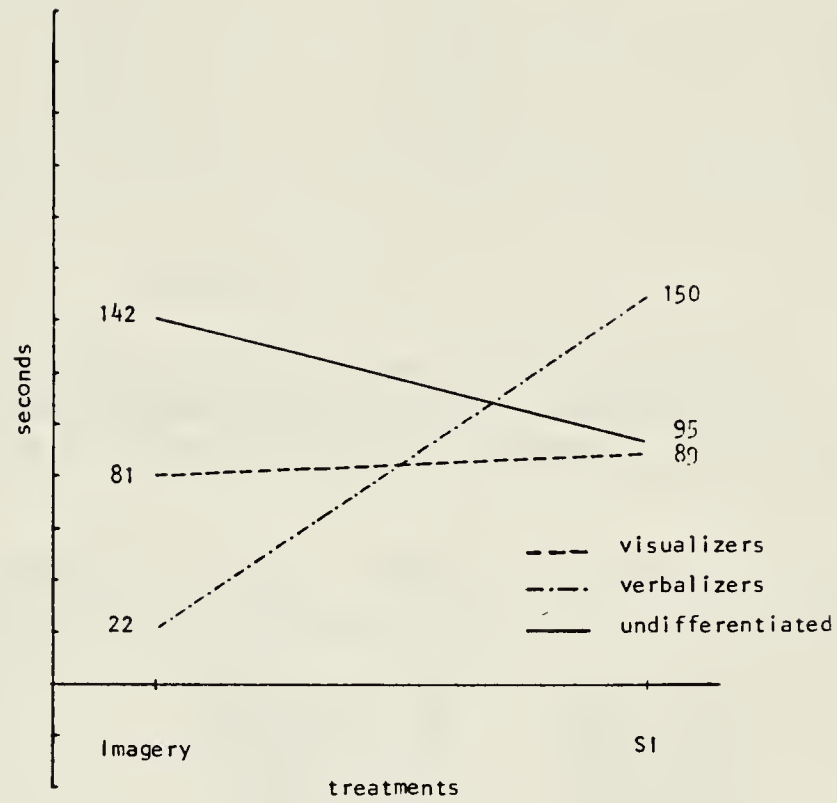


FIGURE 2  
Mean Gain Scores of Men  
on Cold Pressor Task

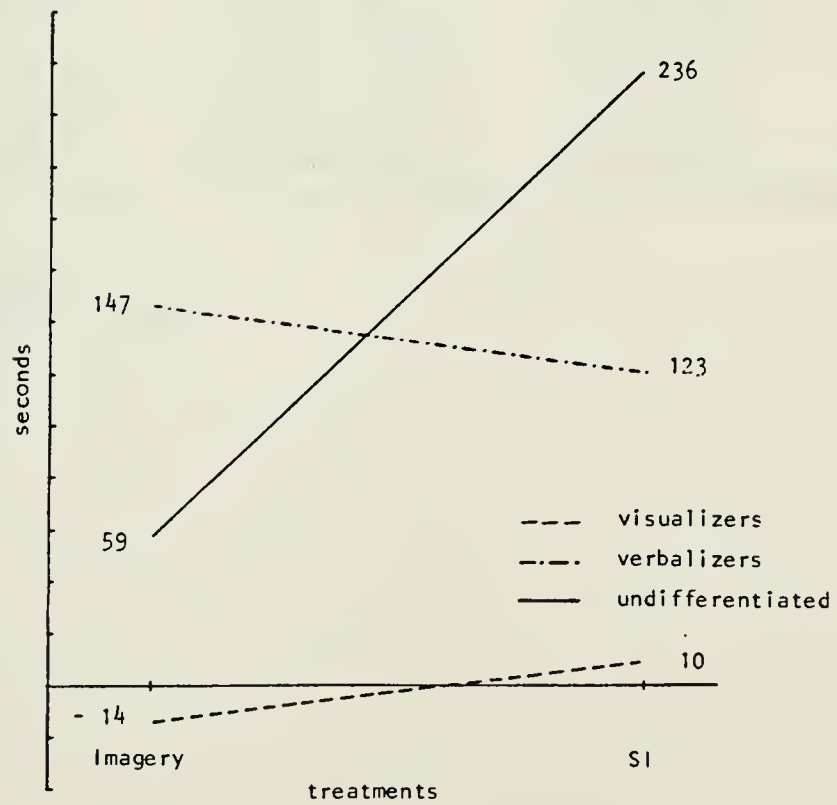




Table 10

Percentage of Subjects who Used Strategy  
That They Were Taught

Group	Used TT.	Combination	Did not Use	Other
Imagery	79.3	6.9	10.3	3.4
Self-Instruc	77.4	12.9	6.5	3.2

Table 11

Summary of Four-Way Analysis of Variance  
Comparing Cognitive Style, Anxiety,  
Complexity, and Risktaking on Measure: Gain Score

Source of Variation	SSq	DF	MS	F
Main effects	96120.43	8	12015.0	1.11ns
Cognitive Style	50199.91	2	25099.9	2.32ns
Anxiety	17890.49	2	8945.24	0.83ns
Complexity	13370.27	2	6685.13	0.62ns
Risktaking	16059.76	2	8029.88	0.74ns
2-Way interactions	224703.06	24	9362.62	0.86ns
Cog.Style X Anxiety	23870.19	4	5967.54	0.55ns
Cog.Style X Complex.	5329.45	4	1309.86	0.12ns
Cog.Style X Risk	5501.49	4	1375.37	0.13ns
Anxiety X Complexity	71639.18	4	17909.79	1.65ns
Anxiety X Risk Taking	30207.84	4	7551.96	0.70ns
Complexity X Risk	61146.76	4	15286.69	1.41ns

Due to empty cells  
the higher interactions  
were suppressed.



also a positive correlation between anxiety and pre-test scores ( $r=.25$ ). There was a positive correlation between value orthodoxy as defined by the JPI and both pre and post-test scores ( $r=.26$  &  $.32$ ).

High scores on the KFFT (that is subjects who were form dominated or visualizers) were negatively correlated with cognitive complexity, responsibility, energy level, and social participation, as measured by the JPI ( $r=-.24$ ;  $-.25$ ;  $-.23$ ;  $-.23$  respectively). There were positive correlations between high scores on the VVQ (subjects who were visualizers) and anxiety, conformity, and interpersonal affect ( $r=.33$ ;  $.30$ ;  $.28$  respectively).

The exploratory hypothesis had suggested that there would not be a significant correlation between the two cognitive style questionnaires (the VVQ and the KFFT). There was no significant correlation between the two tests ( $r=.17$ ) suggesting that they were not measuring the same aspects of cognitive style.





## V. Discussion, Summary and Conclusions

It is the purpose of this final chapter to postulate implications of the results of the study, and to propose areas of further research. A brief overview of the study will also be presented.

The original purpose of the study involved the following investigations:

1. To determine whether the self-instructional and imagery components of SI were more effective than a control treatment,
2. to investigate whether there was any difference between the imagery and self-instructional treatments,
3. to examine whether there was a treatment-cognitive style interaction,
4. To examine whether there were any personality differences related to treatment preference or pain tolerance.

Considering the first concern, that is whether both the imagery and self-instructional treatments were more effective than a control, the initial study confirmed that both treatments were superior to a control treatment. The results of the initial study therefore contradict the findings of Hackett and Horan (1980) who found that self-instructional training was not superior to either imagery training or a control group. Rather, the results of the study support a growing body of literature that suggests



self-instructional training is a viable approach for a wide variety of problems, such as anxiety and depression.

Regarding the second concern of whether there was a difference between the two treatments, both the initial study and the follow up study found that there was no significant difference between the imagery and self-instructional approaches. These findings again contradict the recent conclusions by Hackett and Horan (1980) that self-instructional training is not as effective as imagery in the control of pain. Not only was there no difference between the two treatments, but the data of the follow up study also refuted Hackett and Horan's findings that subjects do not use the self-instructional treatment. It was found that subjects in both treatment groups reported that they used the technique taught. Perhaps one reason why the self-instructional approach was successfully utilized in this study was that emphasis was placed on simplifying its concepts. To the novice, the technical language might be a detriment to following the instructions.

There was mixed evidence concerning the cognitive style-treatment interaction. When, Richardson's VVQ was used to assess cognitive style, there was no treatment-cognitive style interaction. When however, the Kuijt Form-Function Test was used to assess cognitive style, a significant three way interaction between sex, treatment, and cognitive style occurred.



It was found that female verbalizers (KFFT) did significantly worse in the imagery treatment, and best in the self-instructional treatment. Female visualizers did equally well in both treatments, and female undifferentiated (neither form nor function dominated) did slightly better in the imagery treatment than in the self-instructional group.

Male visualizers (KFFT scores) did relatively more poorly in both the imagery and self-instructional groups than their "verbalizer" or "undifferentiated" counterparts. In fact, male visualizers had the lowest tolerance scores among all the groups, including females. Male verbalizers did equally well in both treatments, while males who were undifferentiated did better in the self-instructional group than in the imagery treatment.

Assuming that the KFFT is giving a valid measure of cognitive style, then it would seem that for female verbalizers, there is positive treatment-cognitive style interaction, as this group did best in the self-instructional approach (verbal) and worst in the imagery (visual) treatment. This finding does not support the research of Tucker, Shearer and Murray (1977) who found a trend toward an inverse relationship between treatment modality and cognitive-style (that is, there was a trend for verbalizers to do better in the imagery treatment).

Male visualizers did poorer than female visualizers in both treatments, while male verbalizers did equally well in both treatments. Male verbalizers did however significantly





better than female verbalizers in the imagery group (mean scores of 147 to 22).

Perhaps one reason why female imagers did significantly better than male imagers is that imagery is usually associated with right hemispheric functioning, and women have tended to be superior in tasks that engage this hemisphere. For example, Marks (1972) found that in a picture memory task, the best performances were those of the good visualizing female, and the worst were those of the poor visualizing male.

Male verbalizers might have done better than female verbalizers in the imagery treatment as verbal-logical abilities are believed to be a left hemisphere task and males have tended to be superior in tasks that engage this hemisphere. It is possible that males used their superior verbal ability as a compensatory mechanism to enhance their ability to use the imagery while they were in the imagery treatment. Meichenbaum (1978) has suggested that self-verbalization is the basis to behavior change, even in the imagery therapies. Male verbalizers appear to be more cognitively flexible than their visualizer counterparts who did poorly in both treatments.

There were a number of interesting relationships between certain personality traits and both pain tolerance and cognitive style. The positive correlation between anxiety and pre-test scores was contradictory to most research. It was possible however, that those subjects who



were most anxious did better in the pre-test because their heightened level of arousal and general tenseness about the unstructured task (in terms of coping strategy), made them want to succeed at the task. In other words, they channelled their tension into doing well on the task. Once they were taught some specific coping skills, their arousal level returned to a lower level, and they did as well as their non-anxious counterparts on the post-test. The positive relationship between anxiety and pre-test scores does moreover support the work of Freese (1974) who states that the view that neurotic people have a lower tolerance to pain is a myth. There was a positive correlation between value orthodoxy as defined by the JPI and both pre and post-test tolerance scores. Although this relationship was not specifically hypothesized, one can speculate that those individuals who tend to be past orientated in terms of values and morals would have a more stoic attitude towards pain.

There was also a positive correlation between age and both pre-test and post-test scores. This finding supports the views of Sherman and Robillard and Hall and Stride (cited in Stewart). It contradicts the findings of Collin and Stone (1966) and Woodrow, Friedman, Siegelau, and Morris (1975). This finding helps to refute the many myths about the aged, and supports a growing body of literature testifying to the fact that pain tolerance does not decrease as one gets older.



The positive correlation between self-report and gain scores suggests that the longer subjects tolerated the cold-pressor task, the greater their ratings of discomfort. This suggests that the treatments actually enhanced their ability to withstand pain, and that the subjects did not merely ignore the sensations. The use of self-report measures supports the work of Hilgard (1969) who found self-report measures a valid measure of discomfort.

The positive correlation between self-report and gain scores is consistent with the underlying rationale of the self-instructional approach, but not with the pleasant and neutral imagery techniques. While the self-instructional approach tells subjects to pay attention to the discomfort, the pleasant and neutral imagery training attempts to get the subject to ignore the pain and is more of a distraction technique. The fact that subjects report an increase in discomfort suggests that while the imagery technique is successful, it may not be for the reasons that have been hypothesized. That is, imagery is not a distractor, as the subject is aware of the increase in sensations but is nevertheless able to tolerate the discomfort. This hypothesis is strengthened by the observation that the majority of subjects in the imagery group chose the pleasant or neutral imagery (distraction imagery).

Meichenbaum (1978) has suggested that perhaps one of the reasons imagery techniques work is that they result in the cognitive reinterpretation of the stressful event. In





other words, if individuals can control their images they are more likely to feel in control of their situation, and therefore tell themselves that they are better able to cope. Meichenbaum states that imagery based therapies contribute to change because they:

1. Seduce, convince, and teach the client to entertain the notion that his imagery contributes to the maladaptive behavior,
2. Teach the client to become aware of and monitor his images and note their occurrence within the maladaptive behavior chain, and
3. Alter what the client says to himself and does when experiencing the images.

The consequence of these processes is that they convey to the client a sense of control over his images and inner life, and in turn over his behavior.

Although Meichenbaum's hypothesis is speculative it can perhaps explain why subjects in the imagery group increased their tolerance while at the same time they reported an increase in painful sensations. Meichenbaum's formulation might also explain why male verbalizers were able to do equally well in both the imagery and self-instructional groups. It would seem that if self-verbalization is the basis for the effectiveness of the imagery approaches, then male verbalizers should do well, as verbal ability is a left hemisphere task at which males are adept.



Regarding the relationship between cognitive style and personality traits, the following findings proved to be of interest. There was a negative correlation between the KFFT "G" scores (form orientated or visualizer) and the personality traits of complexity, responsibility, and social participation as defined by the JPI. There was also a positive correlation between high scores on the VVQ (Visualizers) and anxiety and conformity.

Individuals who are classified as extreme visualizers by both the VVQ and the KFFT appear to be more anxious, conforming, less cognitively complex, and somewhat reclusive. This personality description is consistent with the view that imagery is a primary process and less developed than the higher cognitive functions. It would appear that individuals who are operating primarily by this mode are more likely to have difficulties in situations involving interpersonal relations.

Another interesting finding was that the majority of subjects did not have any systematic coping technique prior to receiving their training. After the pre-test, subjects were asked what they had done while their hands were immersed in the water. Their responses were classified into the following categories:

1. No strategy
2. use of imagery
3. use of self-instructions
4. other, such as counting or looking around the room.



It was found (Appendix X1) that regardless of cognitive style classification, most subjects did not have a strategy or used an unsystematic distraction technique. Very few subjects spontaneously used the imagery or self-instructional approaches. It was not surprising that self-instructions were not used as this is a somewhat novel and complex approach. Hackett and Horan (1980) had found however that 60% of their subjects spontaneously used imagery as a coping technique. The results of this study did not support their finding.

### Implications of the Study

The two studies have shown that self-instructional training is a viable technique for enhancing tolerance to pain. If the self-instructional approach is explained in a logical, non-technical manner then it will be used by the majority of subjects. It is the therapist's responsibility to present the technique in a manner that the client understands. Perhaps one of the reasons that Hackett and Horan found self-instructional training to be of little value was that it was not properly presented.

The results of the study also suggest that subjects who are able to tolerate discomfort for longer periods of time are aware of the increased sensations. While the self-instructional approach addresses this issue in its rationale, the imagery technique does not. Perhaps the therapist or experimenter who is using an imagery approach





can explain the rationale in a different manner, that is, he can present imagery as a coping technique, and not as a distraction device in order to enhance its effectiveness.

The results of the study did not support a clearcut relationship between treatment modality and cognitive style. There was a positive interaction for female verbalizers when the KFFT was used to assess cognitive style, but more work needs to be done with this test before any firm conclusions can be drawn.

Although there was not a strong relationship between cognitive style and treatment, some of the subjects' comments about the approaches used might be of benefit to the clinician. A number of subjects who were strong verbalizers commented that they had difficulty forming images, and therefore found the imagery treatment of little value. So while it would appear that in general the self-instructional or imagery approach is equally effective for most subjects, there are cases in which a "resistant" client might be better served by a different technique. In other words, if one is an imagery based therapist and encounters a client who cannot form images, it would be more beneficial to utilize the self-instructional paradigm.



## Implications For Further Research

While the results of this study support the effectiveness of both imagery and self-instructional training, future analogue studies could investigate whether subjects retained the strategies taught by employing a delayed post-test. While analogue research is valuable in its own right (Borkevec & Rachman, 1979), future studies should examine the effectiveness of the treatments in a clinical setting.

In comparing the effectiveness of different treatments it is important to take into account the possible biasing effect of a particular dependent variable. In many cases, subjects in the cold pressor task can cope only for a relatively short period of time (less than one minute). If a treatment such as the self-instructional requires subjects to go through a number of steps, they might have insufficient time to do so. In another test where pain is gradually induced, subjects might have more of an opportunity to use the different stages of the self-instructional treatment. In such cases, the self-instructional approach might even prove to be superior to the imagery technique. Further research is required to test this hypothesis.

Trends shown in the results of this study hold out the possibility that a treatment-cognitive style interaction might be operating. More work is required in establishing tests that can reliably assess the dimensions of



"verbalizer" and "visualizer". The KFFT, while it appears promising, needs more reliability and validity data.

It was noted that some extreme verbalizers could not image at all. It has been proposed by Bandler and Grinder(1977), that it is possible to teach verbalizers how to use their visual representation system. Further studies could examine whether this is viable.

Finally, it was noted that extreme visualizers tended to have "negative" personality characteristics. This finding should be investigated to see whether it was an artifact of the study and the KFFT, or indicative of a relationship between cognitive style and personality.

In conclusion, the results of this study suggest that both self-instructional training and imagery training are effective in enhancing tolerance to pain. More research is however required to test the generalizability of these laboratory findings to various clinical populations.





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## Appendix 1

### Self-Instructional Training

What we tell ourselves about events can influence how we feel about them. The technique that you will be taught will show you how to recognize your negative thoughts about stressful or painful situations and to replace these with more positive or realistic thoughts.

This approach is called self-instructional training. Self-instructional training involves breaking a stressful situation down into three phases while making appropriate self-statements throughout each phase.

The first phase is preparing for the intense stimulation before it becomes too strong. Self-instructions and statements that can be made at this phase include:

(1) What is it I have to do? (viewing the situation as a problem you can do something about)

(2) I can develop a plan to deal with the situation.

(3) Just think about what I have to do.

(4) Don't worry; worrying won't help anything.

For example, many people when faced with the prospect of going to the dentist, tend to catastrophize the event, and say such statements as "it will kill" or "I'm sure I won't be able to stand it", rather than taking it one step at a time.

The second phase is confronting and handling the intense stimulation. Self-instructions and statements that





can be made at this point include:

(1) I can meet this challenge (view the situation as a challenge you can deal with).

(2) One step at a time, I can handle the situation (don't get overwhelmed, just take it easy and relax).

(3) I won't think about the pain, I have been in worse situations, it isn't that bad, I can take it.

So using our dentist example, if you are in the chair and the dentist is drilling and you begin to notice some sensation, you can catastrophize the event by telling yourself that you knew it would hurt and that the pain is bound to get worse. You can however tell yourself some of the realistic self-statements previously outlined in the second phase to help you cope more effectively.

The third phase is coping with thoughts and feelings that arise at critical moments when you notice the intensity of the sensations seems to be increasing or you think you can't go on anymore. Self-instructions or statements that can be made at this phase include:

(1) When I feel any pain, just pause

(2) Don't try to eliminate the pain totally, just keep it manageable (remember you expected to detect some intense stimulation, but don't overreact and make things worse).

(3) I knew the sensations would rise; just keep them under control (don't magnify the intensity of the sensations you are experiencing).



(4) Things are going pretty bad, I just can't go on--hold it, don't make things worse, you can do it, stop exaggerating the situation.

(5) My arm looks terrible, things are falling apart; I better stop--relax, just hang in there a bit longer, you know it isn't dangerous, people suffer worse than this every day.

So if you feel you can't cope with the dentists drill or the cold water task, listen to your negative self-talk and replace it with more realistic verbalizations, such as "I can hang in there a bit longer".

There is one other phase of the self-instructional program that is called self-reflection and positive self-statements. Throughout the three phases described, you might evaluate your performance. For example, how am I doing, etc. It has been found that people frequently criticize their behavior but rarely praise themselves. You shouldn't be "too hard on yourself" but rather pay attention to the positive aspects of your performance and congratulate yourself for doing well. Self-reflective statements that can be used during this phase include such things as:

(1) It isn't as bad as I imagined, I'm doing OK.

(2) I'm getting better at this all the time.

(3) I'm not letting the negative thoughts interfere with my performance.

(4) I knew I could handle it; I'm doing well, or I am doing better than I expected.



The examples given throughout all of the phases are merely illustrative of some of the coping statements that you can use. To briefly review the four different phases, they were: (1)Preparing for the intense stimulation before it becomes too strong, (2)Confronting and handling the intense stimulation, (3)Coping with thoughts and feelings that arise at critical moments when you want to quit, and (4)Self-reflection and positive self statements or congratulating yourself for doing well. What I would like you to do now is to take some time and think about how you will approach the cold-pressor task in a few moments. Remember, you can choose whatever coping statements you desire. If there are any questions feel free to ask .





## Appendix 11

### Imagery Treatment

It has been shown that mental imagery can help increase tolerance to pain. There are however a number of different types of imagery that one can use, and I would like to discuss three main types that have been shown to be effective.

The first type of imagery is called Imaginative Inattention. In this type of imagery you ignore the intense stimulation by engaging in a mental image, which if real, would be incompatible with the experience of pain. For example, imagining yourself enjoying a pleasant day on the beach, at a party you recently attended during which you had lots of fun, or spending an enjoyable afternoon engaged in an activity that you like. The image can be anything that is personally pleasing to you. It is important that you vividly put yourself in the scene to derive the maximum benefits of this approach.

The second type of imagery approach is called Imaginative Transformation of Pain. In this approach you interpret the sensations you are receiving as something other than pain, or minimize the sensations as trivial or unreal. For example, imagining the part of the body that is receiving the intense stimulation as being filled with novocaine and actually imagining the numbness produced. Other examples are, imagining yourself as having limbs of



steel that are incapable of experiencing intense stimulation, or imagining the part of the body that is receiving the stimulation as being made of rubber and therefore unable to feel pain. This type of imagery also works best if you can vividly immerse yourself in the scene.

Finally, the third type of imagery technique one can use is called Imaginative Transformation of Context. In this approach you picture an image or mental scene in which the intense stimulation being received is different from the actual situation. That is, you are aware of the sensations, but you imagine them arising in a different context. Examples are picturing yourself as having been injured in a major sporting match but continuing to play despite the pain, or visualizing yourself as a spy who having been shot in the hand, is trying to elude his enemies. Again, this type of approach works best if you are able to actively imagine the scene.

To summarize, there are three types of mental imagery you can use to help cope with pain. These are:

(1) Imaginative Inattention, or imagining pleasant events incompatible with pain, (2) Imaginative Transformation of Pain, or imagining that the part of the body that is receiving the stimulation has been altered, and (3) Imaginative Transformation of Context, or imagining that the situation in which you find yourself is different. These examples are merely illustrative of the many different situations you can choose. What I would like you to do now



is to decide which imagery approach best suits you and to choose which scenes you will imagine to help you tolerate the cold-pressor task in a few moments. If there are any questions I will answer them for you.





## Appendix 111

### Control Treatment

Pain is many things. It is never a simple one-to-one relationship in which hitting one's finger with a hammer produces a big "ouch", while a little hammer will produce a little "ouch". Sometimes a little hammer can result in a lot of pain, and vice versa. The cause of pain (the stimulus) can have only a limited relationship to the pain felt or received.

Almost 50% of postsurgical patients have no pain at all regardless of the severity or extent of surgery, and in a field hospital during the second world war, only one-quarter of the severely wounded felt they needed any medication for their pain. Moreover, half of civilian patients after surgery have been relieved with placebos (sugar pills) while some cannot be helped by the strongest analgesics. A little personal attention can however sometimes cut the need for analgesics after surgery in half.

### *The Perception of Pain*

The sensation of pain is described by many in terms of free nerve endings, of neurons and synapses, or of the brain stem and the thalamus. The total pain experience--the sensation and perception, and everything else that goes into "feeling" pain is more than its anatomy or physiology. The pain experience is both the past and the present in one, it involves the total human being and everything he's learned



from life.

Pain is usually thought as something we are born with, an intrinsic quality automatically present from birth to protect us from anything injurious or hurtful. But this may not be the case, for there is evidence that we must *learn* to feel pain; that the child must not only have the opportunity to find out that the fire is hot and burns, but must also learn how to feel the pain of the burn. In fact, puppies that haven't had this learning opportunity can be burned or stuck with a pin and will even move into the flame or the pin as they seemed not to have learned to hurt.

The doorbell is a useful analogy in understanding the psychology and perception of pain. Out at the front door (a part of the body) someone presses the doorbell (the stimulus) and the wiring (the pain pathway) carries the signal to ring a bell heard within the house by a person (the brain). Now the person must decide what the ring means and what should be done; answer the door or ignore it; decide whether it's a friend, a delivery, or an intruder. The person reacts--is pleased, angry, feels fear, or terror. This reaction should be determined by who is ringing the bell (the cause of pain, the stimulus), and while in the house one can only guess who's at the front door, he must still do something about it.

Here then is the perception of pain, its psychology. The ringing doorbell--the nerve endings--is the same, as are the wires--the pain pathways--carrying the signal to the



person, the brain, in the house. But if that signal, that hurt, produces a satisfactory excuse to skip a disliked school day, a cut suffered in opening an exciting gift, a threat, or the warning of a heart attack, then in the brain, the reaction and the emotions are vastly different. If the stimulus can't be identified, the reaction depends on one's own interpretation, and that is determined by heredity, past conditioning, and other circumstances. In a sense then, all pain is psychologically determined, depending on how one perceives and interprets the pain impulses in the brain.





## Appendix 1V

## Richardson's VVQ

1. I enjoy doing work that requires the use of words.  
(F)
2. My daydreams are sometimes so vivid I feel as though I actually experience the scene.(t)
3. I enjoy learning new words.(f)
4. I can easily think of synonyms for words.(f)
5. My powers of imagination are higher than average.(t)
6. I seldom dream.(f)
- 7.I read rather slowly.(t)
- 8.I cannot generate a mental picture of a friend's face when I close my eyes.(f)
9. I don't believe that anyone can think in terms of mental pictures.(f)
10. I prefer to read instructions about how to do something rather than have someone show me.(f)
11. My dreams are extremely vivid.(t)
12. I have better than average fluency in using words.(f)
13. My daydreams are rather indistinct and hazy.(f)
14. I spend very little time attempting to increase my vocabulary.(t)
15. My thinking often consists of mental pictures or images.(t).



\*The letters (f>false and (t>true indicate the direction in which responses have been keyed in scoring the VVQ.

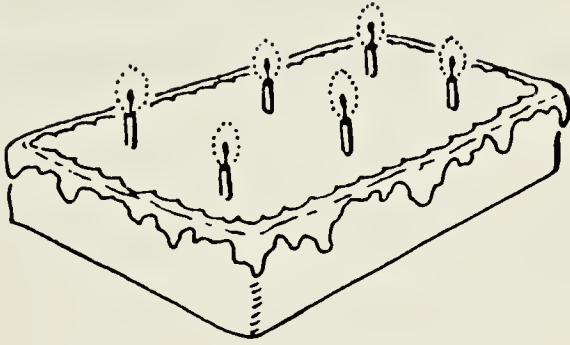
Richardson suggests that a score of 6 or less is a habitual verbalizer, while a score of 12 or more is a habitual visualizer.



## Appendix V

## Kuijt Form Function Test

10



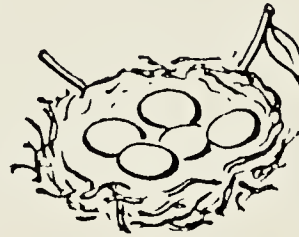
11



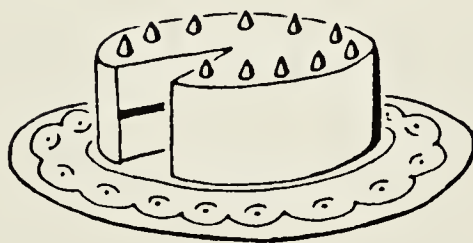
13



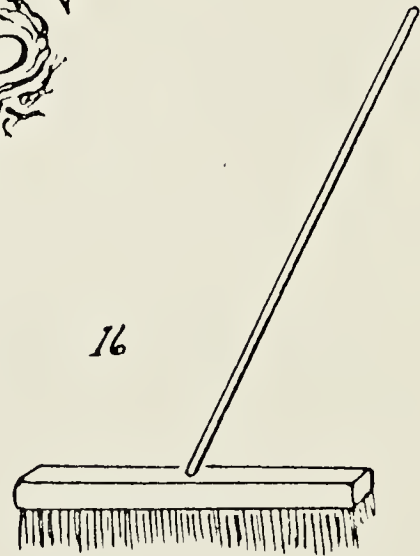
15



14



16







## Appendix V1

## Self-Report Questionnaire

ON AVERAGE HOW MUCH DISCOMFORT OR PAIN DID YOU EXPERIENCE  
WHEN YOUR HAND WAS IN THE WATER?

1            2            3            4            5            6            7

no pain

moderate

extreme pain



## Appendix V11

### Rationale for the Experiment

My interest is in studying some of the techniques that will help people cope with pain that they might encounter in daily situations, such as going to the dentist, getting needles, etc. Since I will obviously not pull your tooth or give you a needle, I intend to simulate the feeling of discomfort by asking you to hold your hand in ice water on *two* separate occasions during the hour time period of this experiment. Some people find the ice water uncomfortable, but it is *not* dangerous.

I will instruct you in a pain control technique, and then give you the opportunity to demonstrate to yourself that it really works. I hope that the information you learn will be helpful to you in reducing discomfort that you may experience in the future.

I will also ask you to complete two brief questionnaires during the experiment, and to take one personality test at home(it takes about 45 minutes to an hour to complete), as I am also interested in looking at the relationship between certain personality traits and pain tolerance. If you are interested, I would be glad to give you feedback on your results when I have completed scoring the tests. If you wish to terminate your involvement in the experiment, you may do so at any time.



## Appendix V111

### Pre-test Instructions

Before we go any further, I would like to find out how long you will tolerate keeping your hand in ice water. If you have ever reached into a tubful of ice to get a soft drink, you know that holding your hand in ice water can be uncomfortable. In just a little while, I will ask you to immerse your dominant hand in the ice water until your middle finger just touches the bottom of the bucket like this (experimenter demonstrates). You should try not to move your hand. When you feel you can no longer tolerate the ice water, remove your hand and I will provide a towel and warm water for you. Do you understand the instructions? Would you mind repeating them to me so that we can be sure that we agree on what you will be doing. When I say "now" place your hand in the water.





## Appendix 1X

### Self-Instructional Approach

Thank you again for participating in the experiment. Right now I would like to tell you some things about pain that you might find helpful in increasing your tolerance to this ice water in particular, and pain in general.

You know, it has been shown that what we think about events can influence how we feel about them. For example, going to the dentist can be an unpleasant experience for many people as they get themselves so worked up over the appointment by telling themselves such things as "this will kill", or "why did I ever make the appointment" etc. As you can imagine, if you tell yourself these types of negative thoughts enough times, by the time you do go to the dentist you probably will be a nervous wreck. You can notice how what we tell ourselves about a situation can influence how we react to the event.

The mistake that most people make when thinking about painful situations is that they tend to see the event as something overwhelming that they cannot cope with. So going to the dentist is seen as being a very painful experience that is sure to be unpleasant.

Perhaps a better way to think about pain is as a process that has at least three definite steps. In other words, you break down the painful situation into a number of different stages. The first stage is our thoughts about the



event before we even encounter it. Some examples are the catastrophizing cries of "the drill will kill me", in other words getting yourself worked up before the event even occurs.

The same logic applies to the cold-pressor test. You can prepare ineffectively by catastrophizing and thinking such things as "this will kill", or "why did I ever get talked into this" etc. You can, however, prepare yourself more effectively by not thinking of the ice water task as one global event. Rather you might start out by thinking such thoughts as "sure the first few seconds are tough, but I can do it", or "sure it will be cold, but I can handle it". The first stage can be viewed as "psyching" yourself up to get over your initial fears, be it going to the dentist or sticking your hand in ice water.

Once you've gotten over the initial hurdle, the next stage is when you actually find yourself in the painful situation, but have not as yet begun to experience any discomfort. It's at this point in time that many people once again let their negative thoughts interfere with their coping ability. Let's assume you have gotten over the initial fear of going to the dentist and are sitting in the chair as he drills your tooth. Many people will at this point in time start to again catastrophize and think such thoughts as "I know the pain is going to come and boy will it kill" or similar type statements that will decrease their ability to cope.



When you hear yourself thinking such thoughts, this should be a clue or a reminder for you to switch to more positive and realistic thoughts. Let's use the ice water task as an example of what I mean. You have successfully completed the first hurdle and your hand is immersed in the water. It feels cold, but it has not begun to hurt. It is during this time that many people tend to think about all the bad things that could happen such as "it doesn't hurt yet--but it's only a matter of time", or "why did I do this, my hand will never be the same" etc.

If you find yourself thinking about all the possible horrible events that might occur, then you probably won't tolerate the pain for a very long time. This goes for the ice water task, or any other stressful situation that you might find yourself in. When you hear yourself thinking these negative thoughts, this should be your signal to switch to more positive statements such as: "Hey I can meet this challenge", and by calling it a challenge you are seeing the situation as something you can deal with rather than as a problem. Other positive statements that you can use while your hand is in the water include: "I know it's going to hurt a bit, but I can deal with it", or "people cope with worse pain than this daily", "I'm not going to think about the pain, it will just make it worse if I do" , or "one step at a time--I can handle it". These are just some of the statements that you can use to help increase your tolerance of the ice water.





Finally, we come to the last stage in the pain process which is called the critical moment. It is here that you actually experience pain and want to leave the situation. It is when the dentist is drilling and you are thinking "I cannot take it--I'm going to pass out". With the ice water task, the critical moment is when you have your hand in the water and you begin to think "I can't take it any longer, I'm going to have to pull my hand out".

The way to get over this critical stage without giving in is also based on the idea that what we tell ourselves about an event can influence how we feel about it. So if you convince yourself that the pain is unbearable, you won't tolerate it for very long. If however, you again recognize your catastrophizing statements such as "I can't go on", and replace these with more realistic ones you will be able to get over the critical period. Once you do so, you will find that these critical periods come and go. It is like jumping hurdles and if you can get over these obstacles, the pain will decrease until at some later time you have to again make a decision about whether to remove your hand from the water.

Some of the positive coping statements that you can make to help clear these hurdles include: "I knew the pain would rise--don't be surprised, hang in there and it will subside", or "when I feel any pain--just pause and tell myself that I can stay a bit longer". Often you will hear yourself saying such statements as "things are going bad, I



can't take it". This could be countered with "sure you can". The negative thought "my arm will fall off" could be countered with the realistic appraisal of "don't be silly, it's unpleasant but not dangerous--I will stay in just a while longer".

So you see by watching what we tell ourselves, we can extend these critical periods whether it involves putting a hand in ice water, facing the dentists drill, or similar type situations that can cause pain and discomfort.

Throughout each of the stages that have been talked about, you can reward yourself for doing a good job. Many times we criticize our behavior, and rarely congratulate ourselves for succeeding, so it is all right to congratulate yourself for getting past each step. Instead of saying "how this is tough", or "I'll never do it", you might try such statements as "I've gotten over the first stage and it wasn't that bad", or "I'm doing well, it's not as tough as I thought", or "I'm not letting my negative thoughts interfere", etc. It is important to encourage ourselves to continue on in an experience that isn't a pleasant one.

To summarize what's been said so far. What we tell ourselves about a painful situation can influence how we react to the event. If you tell yourself all sorts of negative things, you probably will not tolerate the situation for a very long time. Thinking, however, of pain as a three stage process instead of one huge obstacle will help your tolerance level.





During each stage you can tell yourself positive and realistic coping statements that will help to increase your ability to withstand the discomfort.

What I'd like you to do right now is to try and think up some statements that you might say to yourself during each stage of the pain process. I'll name the stages for you, and you think of some appropriate coping statements to help yourself tolerate the ice water when you place your hand in the water in a few minutes.

The first stage was preparing to meet the stress even before you placed your hand in the water. Imagine I'm sitting here with my stopwatch and I say "you can place your hand in right now". You look down into the cold water and think--what will you tell yourself to get over this first hurdle (pause in tape for about 45 seconds)? How about stage 2--what will you tell yourself while your hand is in the water? The water is getting colder, but you haven't yet begun to feel pain (pause in tape for about 45 seconds). What will you tell yourself during those critical moments when you feel the pain and want to quit the situation (pause about 45 seconds in tape)? Finally, what kinds of statements might you say to congratulate yourself for getting over these hurdles?

If there are any questions please feel free to ask me. I would encourage you to use the techniques that have been discussed, when you undergo the cold pressor task in a few moments. You may remove your headphones.





## Appendix X

### Imagery Treatment

Thank you again for participating in the experiment. Right now I'd like to tell you some things about pain that will help increase your tolerance of this ice water in particular, and painful situations in general. You know it has been shown that what people imagine can be very important as far as how well that distraction decreases pain. There are however, a number of different types of imagery that you can use, and I'd like to discuss five main types that have been found to be effective.

Many people, when faced with a painful, or unpleasant situation try to deal with it in an unsystematic or haphazard way. For example, when faced with the somewhat painful (for most people) experience of having their tooth drilled, many people simply grit their teeth and bear it, or resort to some distraction technique such as counting to ten. The mistake that many people make when undergoing a painful situation is that they believe that there is nothing they can do to lessen the discomfort.

There are however, certain things that you can do to cope more effectively with painful situations. Mental imagery is one technique that you can use to help deal with discomfort.

Many people have found pleasant imagery to be effective in helping to increase their tolerance. For example, imagine



yourself lying on your back in a field. It is early summer, and you feel a warm gentle breeze flowing. You hear the wind in the trees, and you see the wind blowing the grass around you. As you look up in the sky, you can see a small fluffy cloud floating slowly across the sky. You can see the outline of the face of an old man in the cloud, or maybe the outline of a horse.

This is only one example of pleasant imagery. If the warmth of the sun is not particularly pleasing to you, then you can imagine something else. For example, some people enjoy imagining that it is a clear winter day in the rockies and that they are skiing. If this type of imagery is more to your liking, then you would try and hear the wind blow as you raced down the hill, or see the snow glistening off the mountain, and hear the crunch of the hardpacked snow as your skiis glided over the ground.

You see, it really doesn't matter what you imagine, as long as you see yourself in a scene or activity that is pleasing to you. The scene that you imagine, should however, occupy your attention for a long period of time, thus keeping your mind off the pain, be it the dentist's drill or having your hand in ice water. The idea is to actively see yourself in the scene, as this technique will be particularly effective if you can get yourself involved in the imagery. You should especially try to immerse yourself in the scene during those critical moments when you are trying to decide whether or not to quit the painful situation, be it the



dentists drill, the ice water or other situations.

While imagining pleasant events is effective in helping to control pain, you can if you wish, choose to imagine a situation that is not necessarily pleasurable, but rather occurs on a very routine basis. There are things that we do on a routine basis that keep our minds occupied for a long period of time. For example, most people have a routine built around taking a shower. Now, I don't know your exact routine, but you might imagine yourself preparing to go the shower room. You gather up your soap, towel and other things that you might take. When you get in the shower you probably lay all the things out so they are handy. You then proceed to wash. Many people have a set order that they wash themselves in, for example you might wash your hair, then your face, then your left arm and so on.

The main idea is to see yourself doing something that has a routine quality about it, so you can visualize every step in the process and distract yourself for a long period of time. So the routine imagery will help to keep your mind off the pain be it the dentists drill, the ice water, or similar type situations. The type of approach also works best if you get very involved in the scene.

You'll notice that the types of imagery that have been discussed so far have both involved imagining events to distract the pain. I'd like to discuss some other imagery approaches that are a bit different from the ones mentioned so far. Instead of trying to eliminate the pain totally, you





can try to imagine that the painful sensation is something less painful, or minimize the sensation. There are a number of ways you can accomplish this. Say you're dreadfully afraid of needles but require a shot. You can imagine that your hand has been injected with novocaine and that the sensation you are receiving is really a dull discomfort, but is not painful.

In the ice water task, you could imagine that your hand has been filled with novocaine, and actually feel the numbness that is produced. You could also imagine that your hand is made of rubber or steel and therefore unable to feel extreme discomfort. You'll notice that in this type of imagery you don't imagine events, but rather try to change the sensation by changing or altering the body part receiving the sensation. So if your hand is made of rubber or steel, you would feel only a prickling sensation, rather than extreme pain. If you went to the dentist you could imagine your tooth being made of steel. With the cold-pressor task, you could try to imagine your hand as being made of rubber, steel, or filled with novocaine.

It is also important in this type of approach to actively participate in the imagery. So if you were to imagine that your hand was made of steel, it would be important for you to really get a clear view of this in "your mind's eye". You should also intensify the image during those critical moments when you feel like quitting, whether that involves the dentist, the ice water or any



other situation you might encounter.

There is another type of imagery you can use that combines the features of the two approaches discussed so far. Instead of however imagining a pleasant or routine scene to distract the pain, or changing the sensation by imagining that the part of the body receiving the pain has been altered, you change the pain sensation by imagining that the situation in which the pain is received is different. That is, you are aware of the sensations, but imagine them arising from a different context--you are changing the situation. Let's use a concrete example to illustrate what I mean. Say you have to have a needle in your leg, well you can imagine that instead of being in a doctor's office you are on a tennis court playing a championship match, and that the pain from the needle is actually the result of falling while making a difficult shot. You can imagine that the crowd gives you a standing ovation, and you continue to play despite the discomfort.

In this type of imagery approach, the pain is not ignored, but rather the situation in which it arises is altered. The context that you imagine can be one of fantasy and doesn't have to be based on reality. So you can imagine that the pain in your hand is the result of being chased by spies etc. You can create any scene you desire. The main idea, as with the other approaches, is to create a situation that is different from the one you are in, be it the doctor, dentist or cold-pressor task. As with the other imagery





techniques you should actively image the scene.

You might notice that despite the fact that you are involved in the imagery (of whatever type) there will be moments you feel like quitting. If this should occur, there is a type of imagery you can switch to in order to help you overcome this hurdle. The approach involves actually seeing yourself overcoming the obstacle. For example, if you fear the dentist's drill you can imagine yourself going to the dentist, sitting in the chair and having your tooth worked on without any dreadful events occurring. You could also imagine the dentist commenting on how well you have coped. The same approach can be used with the cold-pressor task. If you should become aware of any intense discomfort, you can switch to this "coping imagery" and actively see yourself succeeding at the task. You can imagine yourself telling yourself how well you've done, and being congratulated for your performance. This coping imagery can be used by itself, or in addition to any of the imagery approaches discussed thus far. Like all of the approaches it too works best when you involve yourself in the imagery.

To summarize what's been said thus far. When faced with situations that are painful or unpleasant, mental imagery can be effective in helping to decrease the pain. There are however a number of different types of imagery approaches you can use. One type involves imagining events that are personally pleasing to you, such as lying on the beach, or skiing. Another type involves imagining routine events that





do not have to be personally pleasing, such as driving to work, taking a shower, or fixing breakfast. Another approach involves transforming or minimizing the pain sensation. You can do this by imagining that the part of the body receiving the stimulation is made of rubber, steel, or filled with novocaine. Another approach involves changing the context in which the pain is occurring. So if your hand is hurting, instead of being in a doctor's office, or in an experiment, you are playing a championship tennis match with a sore hand to a crowd of cheering fans.

Finally there is the type of imagery in which you actively see yourself succeeding at the stressful or painful task, be it having your tooth drilled or undergoing the cold-pressor task. This type of imagery can be used by itself or in conjunction with the other approaches mentioned so far. All of the imagery approaches discussed work best if you involve yourself in the activity. What I'd like you to do right now is to decide which of the imagery approaches that have been discussed best suits you. In a few moments you will again be asked to place your hand in the ice water and I'd like you to rehearse in your mind the imagery you will use to help tolerate the water. Try to run a movie of the scene in your mind's eye. I would encourage you to use the approaches that have been discussed, although you may try a number of different imagery techniques if the one you chose doesn't appear to be working. If you have any questions I will answer them for you. You may remove your



headphones .



Appendix X1

Percentage of Subjects Who  
Spontaneously Used Imagery  
During the Pretest

Cognitive Style	No Treatment	Self-Inst	Imagery	Other
Visualizer	26.7	13.3	0	60
Verbalizer	40	13.3	6.7	40
Undifferentiated	30	10	20	40





## Appendix X11

## Random Post Treatment Verbalizations

Subject 1: I imagined that I was in Jasper camping. I really like the mountains so I was able to get into the scene. I basically recalled my trip there last month and revisited the places I had been to. (Rated as using Imagery Treatment).

Subject 10: I told myself that it wouldn't be that bad. Once my hand was in the water I kept reminding myself that I've tolerated worse things than this and that I could do the task. When I wanted to take my hand out of the water I told myself that I could keep it in for a while longer. (Rated as using SI Treatment).

Subject 22: I tried to imagine that I was on a beach, but had trouble keeping the image as it would fade in and out. I would then look around the room and read what was on the boxes. (Rated as partially using Imagery Treatment).

Subject 44: I just kept counting till I couldn't stand the cold any longer. (Rated as not using SI treatment).







**B30310**